Conducting HCI Research with the Deaf Community in American Sign Language: Practices and Experiences

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Abstract

Our team of culturally Deaf ASL-signing and hearing non-signing HCI researchers conduct research with the Deaf community to create ASL resources. This case study summarizes reflections, learning, and challenges with HCI user study protocols based on our experience conducting five user studies with deaf ASL-signing participants. The case study offers considerations for researchers in this space related to conducting think-aloud protocols, interviews and surveys, getting informed consent, interpreter services and data analysis and storage. Our goal is to share the lessons we learned, and offer recommendations for future research in this area. Going beyond accommodations and accessibility, we hope these reflections contribute to a shift toward ASL-centric HCI research methodologies for working with the Deaf Community.

CCS Concepts

• **Human-centered computing** → **Accessibility**; **Interaction design process and methods**.

Keywords

American Sign Language, ASL, Research Methods

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1 Introduction

Over the past three years, our core research team comprised of deaf ASL-signers, hearing ASL-signers, and hearing non-signers have collaborated in HCI research, conducting five user studies with participants from the Deaf Community[1]. Because of our team composition, we were acutely aware of the importance and potential impact of our language and communication choices, so we repeatedly chose to invest significant time and effort to prioritize offering elements of our studies in both American Sign Language and printed English [4, 5, 25, 26]. At every step, we uncovered our own cultural and language biases and worked to address them. We carefully considered the responsible conduct of research, including the participants' rights and the researcher's ethical responsibilities. Our commitment to offering a respectful and welcoming space for all deaf participants and colleagues was a driving factor as we developed the design of each study, and yet, we still found it necessary to continuously evolve our designs and practices for standard research elements.

We engaged in continual discussion to explore how existing HCI methods, which are well-defined for hearing and speaking users, do not always translate well for deaf ASL-signing researchers and participants. As each discovery triggered adjustments to the next study, we essentially piloted a series of redesigns to various elements, including presentation of demographic and other surveys; the way we managed consent forms; whether, when and how interpreters were used in the conduct of the interviews; and our data analysis protocols.

As we were exploring novel interfaces and study practices, it was not always possible to predict the impacts of each design choice. Some of the innovations our team developed were positively received and improved the reliability of our results, while others instead posed barriers to seamless participation. We reflected on what was learned, retooled our processes to the extent possible,

[1]Capitalized 'Deaf' refers to individuals who self-identify as culturally Deaf (e.g. all ASL-signing members of our research team), who often are also ASL signers in the U.S. Non-capitalized 'deaf' refers to all individuals who are deaf, deaf-blind, deaf-disabled, and hard of hearing whose specific cultural and linguistic identities are not known. The term Deaf Community is used in this paper to refer to all individuals who identify as members of this community, whether they refer to themselves as D/deaf, DeafBlind, DeafDisabled, hard of hearing, late-deafened, and/or hearing impaired.

and imagined the types of ASL-ready materials, templates, methodologies and procedures that might address the barriers and issues identified in previous studies.

We set out to accomplish the initial aim of our project: to study the novel research area of ASL-centric user interface designs, features and elements. Over the course of our project, we added a second primary goal: to identify, develop, and test approaches that create more equity for deaf individuals participating in and conducting HCI research. In this case study, we summarize the studies we conducted, reflect on our processes and experiences, and offer considerations for respectfully planning, conducting, and analyzing user studies with the Deaf Community, and securely storing ASL study data.

2 Background

User-centered research, participatory methodologies, and user studies are central to accessibility research in the human-computer interaction field. According to a literature survey of 506 accessibility papers published in CHI and ASSETS from 1994 to 2019, 94.3% of the papers contained user studies, and the most common methods were interviews and usability testing [23]. This literature survey also found that 11.3% of the research papers were focused on the Deaf Community [23]. In the ACM Digital Library, using the search terms "deaf" and "user study", we found a total of 73 research papers: 37 full research articles in CHI, and 36 research articles in ASSETS. Most publications report on user studies with participants who are deaf and hard of hearing, and both qualitative and quantitative methods are employed. The research is spread across domains, including education [8], news [2], meetings [27] and sound detection applications [6]. Most focused on the presentation of content, specifically how English text or spoken content is delivered to deaf users, e.g. captions placement, style, and generation; simplifying or highlighting English text for faster, easier comprehension [13, 15]; and automatic speech recognition [3]. Other studies evaluated visual elements, such as icons, emojis, or other image and video styles of presentation [12, 16, 27]. A smaller set of studies focused on signed languages, e.g. signed language avatars or animations [14, 18, 22]; signed language recognition; and data set collections [7].

In these studies, researchers requested the participation of deaf ASL-signers. However, it is not consistently reported which language(s) the user study was conducted in, the materials used in the study, and whether study tools and materials were offered in English, ASL or both [24]. Details about how participants were recruited, their language preferences and proficiencies, and their identities were also not always reported. Other information, such as how the team handled ASL video data collection, data analysis, and storage of larger video files were not shared. This may be due to page limit restrictions and underlying assumptions about how things are done and what needs to be documented. Our goal in this paper is to document and share several of the strategies and techniques we developed and refined to align with the requirements of ASL-signing researchers and participants.

3 Summary of User Studies and Methods Followed

Table 1 provides an overview of the five user studies we have conducted. Three studies were published in two papers, one at CHI 2022 [26] and one at ASSETS 2023 [4].

4 Reflections and Methodological Considerations in the User Studies

In this section, we reflect on the methods we followed in the studies, detail the considerations and challenges we encountered, and report on the modifications we adopted to ensure the participants felt welcomed and respected.

4.1 Inclusion and Integration of All Team Members

We saw the diversity of the team as a strength and a factor that contributed to our continual learning and improvement. Hearing non-signers brought various levels of expertise in HCI and offered training to the ASL signing team. The ASL signing team members had expertise in linguistics, education, translation, interpreting and offered training to the HCI team. We strongly encourage hearing and/or non-signing researchers to ensure that their research designs are developed by and in collaboration with Deaf ASL-signing research colleagues, preferably in leadership roles. To enable our strong collaboration, we actively worked to ensure inclusion and integration of everyone in our team meetings and in the conducting and analysis of our studies.

In our team meetings, we worked with a core group of ASL interpreters who became increasingly familiar with us and our work. We found it essential to brief the interpreters in advance, providing relevant background information and sharing meeting agendas and study materials with them. This contributed to the success of the interpretation and helped to avoid confusion and miscommunication. In technical settings, there are always terms and abbreviations that require some background to effectively interpret. Additionally, we found that some interpreters were more comfortable with and suited to this topic than others.

In our studies, we found it most effective when the Deaf and hearing ASL-signing researchers engaged directly with participants in ASL to conduct the studies, which also meant that we did not need interpreters to engage with the participants. This required that the hearing non-signing members of the team, who had experience conducting HCI research, train and prepare the ASL-signing members of the team. Interpreters were hired to provide transcripts (live or recorded later), or to provide access for the hearing researchers who were co-moderating or observing the study. At times, the hearing non-signing researchers also asked questions, gave instructions, and observed the research with the support of interpreters. Whenever possible, we worked with a consistent interpreting team in our meetings and studies.

Our team also became increasingly aware of the many ways that the Deaf and ASL-signing researchers were supporting their non-signing hearing colleagues, for example by managing the pacing of meetings, or arranging and prepping interpreter services. To shift the paradigm, all researchers and members of the team worked harder to share responsibility for full team engagement, rather than assuming that others would accommodate one set of particular language preferences and needs. This required that we share the responsibility of confirming interpreters for meetings, pausing regularly during meetings, and scheduling occasional debriefing sessions to discuss whether all members of the team were equally welcomed and respectfully engaged.

User Study Conducted	Goal of the Study	Number of Participants	Remote/In-person
Study 1: Semi-Structured Interview Formative Study (2020)	Exploring ASL only online resources with a focus on search, navigation, and layout	7	Remote
Study 2: Think-Aloud Study (2021)	Understanding the challenges of navigating surveys in ASL without reliance on English	7	Remote
Study 3: Think-Aloud Study (2022)	Investigating user experiences and perceptions of novel survey designs	7	Remote
Study 4: Interview Study (2022)	User preferences about customized video elements, styles, and page layouts to create navigation cues, page headings, and menu options	12	Remote
Study 5: Eye Tracking Study (2023)	Scanning patterns of Deaf users when viewing on-screen material	14	In-person

Table 1: User studies conducted by the team

4.2 Participant Language Access and Equity in Studies

An unexpressed assumption in many research papers in the U.S. is that the research is conducted in spoken and print English. The language of an HCI study is rarely considered, and almost never reported on explicitly. However, because our studies explored user interface designs for deaf ASL-signing audiences, all study participants were confirmed to be deaf individuals whose primary language was ASL. For ASL-signing individuals, access in their primary language almost always requires conscious, deliberate and effortful consideration. Prospective study participants assume that engagement will rarely be in ASL, and that they will be required to accommodate the lack of signing ability of others. This is the result of a lifetime of experiences where they are required to educate others, including those who request their participation in research.

Our goal was to not burden the participants with accommodating us, but to invest in the careful consideration and considerable effort required to offer as much of the study content in ASL as possible. This meant not relying solely on the easiest or most cost-effective options, but adopting the language preferences of our colleagues and participants. Although many signers are bilingual (e.g., with high comfort levels in both ASL and English), we did not use automated translation from spoken English to English print (e.g. captions). Accuracy rates of auto-transcription are too low to ensure effective engagement for either the ASL-signing deaf participants and researchers or the non-ASL-signing individuals. Especially while conducting research in the field of accessibility, we felt that it was essential to collect insights about users' lived experiences in their most accessible and comfortable way.

4.2.1 Study Preparation. As we developed study protocols, we closely examined the methodology and processes to ensure that Deaf participants did not experience any barriers to completing study tasks. For example, it is important to consider that to participate, the participants may need to momentarily pause their hands-on exploration to describe their thoughts and actions in ASL. The hands and eyes cannot be used simultaneously to interact with the interface and report on their perceptions of it. In addition, the Deaf and ASL-signing researchers are required to use their eyes to both observe the participants' ASL comments and observe their physical interactions with the interface. While quickly alternating between commenting and interacting could disrupt the flow of user experiences with the prototypes, in our case, this was managed by the ASL-signing research team and participants, who have had a lifetime of experience with managing visual attention in this way.

4.2.2 Providing Study Materials in ASL. For all studies, we aimed to provide access to the study materials such as consent forms and surveys in ASL whenever logistically possible, either via pre-recorded videos or live, as will be described below. However, translation of standard English forms and questions into ASL is almost never a simple and straightforward task. Our team considered the overall goal of the material, the content, how it was structured, and specific terminology before beginning each translation. In addition, cultural awareness is required when developing questions about background and demographics. We also sent English versions of documents and materials to participants ahead of time whenever possible, so that they had a chance to review and ask questions.

Participant Informed Consent: In all five user studies, participants were asked to sign an informed consent form prior to the interview. Due to the lack of available ASL versions, the English print version of the consent form was shared in advance, and one of the ASL-signing researchers reviewed the form in ASL with participants before they provided consent. It is important to consider that Institutional Review Boards (IRBs) approve user study procedures and materials, including consent forms. As most IRB members do not know ASL, it is a challenge to develop an effective process that will allow them to verify and approve translated materials. Therefore, it is rare that a research team can get participant consent in ASL without at least including or partly relying on the English form.

Demographics and Other Surveys: As part of Study 1, which was a formative semi-structured interview study, we asked participants to complete a demographic survey in ASL before participating in the interviews. The Deaf and ASL-signing researchers on our team translated or developed a set of valid culturally and linguistically appropriate questions and answer choices, and then filmed them in ASL. We added the ASL videos to Qualtrics due to its robust data analysis and reporting power. Significant video editing was required to format the videos to align with Qualtrics platform requirements. The interface design, development, and implementation challenges we encountered from that point on were primarily due to the lack of ASL-centric video-aligned features, interface elements, and templates available in the platform, and took months to resolve. Despite the efforts, the final result was still not easy to

navigate, and was frustrating for the study participants. Support from the research team was needed for successful completion.

Despite the challenges, participants' comments affirmed that we had made a good choice to provide the survey in ASL. They expressed increased confidence when responding to an ASL-survey, and noted how markedly different this was from the their everyday experiences interacting with materials provided only in English. They also shared that offering the choice to use their first/strongest language felt more respectful to them as ASL-signing culturally Deaf individuals who were volunteering their time to support research.

The underlying UI design issues we encountered when adding ASL to an existing text-based survey platform then became an area of research for our team. We began working to build an ASL-centric research tools, starting with an ASL survey prototype [5, 26]. As this work was still in progress during the remaining studies, we reluctantly offered demographic surveys via Qualtrics in English with ASL-signing researchers reviewing the questions in ASL with participants. However, in future studies we plan to use the ASL-centric survey tool to present ASL questions and answers in a custom designed interface that allows study participants to view and respond easily and quickly.

Validation and Sharing of ASL Study Materials: Research teams that engage deaf participants may choose to develop materials in ASL; however, such materials are not shared in a systematic way with the broader research community. Open access to research materials in ASL and other signed languages, e.g. a shared pool of demographic questions in ASL, would be beneficial. Before sharing, to confirm materials are of high quality, they could be vetted by implementing protocols of review and testing, to ensure there are no known language biases, that they are inclusively framed, and will be viewed as respectful to participants from a wide variety of backgrounds. This would reduce the significant up-front effort each research team currently faces to film all materials from scratch and, in some labs, to also evaluate them for bias and validity before using them. Without widespread sharing of resources and practices, each research team needs to invest considerable effort and resources to develop ASL versions of materials, interpret them live, or choose to simply provide them in English. In some situations, this effort is prohibitive.

4.3 Adapting HCI Data Collection Methods for ASL

Through the course of our research, we spent significant time considering standard HCI practices and determining the adjustments needed to ensure that the same experiment goals could be achieved when the study was done in ASL. When a participant needs to actively engage in hands-on activities during a study, such as interacting with prototypes or using devices like eye trackers, special attention is needed to ensure equitable access in sign language. Conducting detailed pilot studies and eliciting feedback from deaf team members before the final data was collected was essential to enable seamless communication in ASL between the facilitator and participants throughout the study. Below are specific areas where we learned from pilot studies, adjusted established protocols, and iterated on our study methods.

4.3.1 Translating the Research Protocol to an ASL-friendly and Culturally Appropriate Version. The team worked collaboratively to develop user study plans. The ASL-signing researchers provided feedback on the language, sequence, and proposed methods. After we agreed on the protocol and questions, the ASL-signing researchers created a script that served as a reference while conducting the study in ASL. This version was written in English but in an ASL-friendly (glossed) version. For example, a question in our Study 1 interview was "Thinking about the layout and organization of the content on the page, what did you find valuable? What could be improved?" The ASL-signing researchers discussed the differences in how English and ASL deal with degrees of vagueness and specificity, and we added a note in the script to avoid offering specifics that may bias the study participant's responses. A similar process was followed when finalizing the content of the screener survey used in the eye-tracking study and demographic surveys for all the user studies we conducted. The questions were first drafted in English, then the language was reviewed and edited to ensure that questions were asked in a culturally and linguistically appropriate way. In addition, all of our study prototypes presented content exclusively in ASL videos, in an interface design that aimed to be ASL-centric. This required that we script and film all content in ASL, edit the videos, review and revise as needed, and then insert final video clips into our prototypes.

4.3.2 Think-aloud Methods Modification. In the formative stage of our research, a think-aloud study was a good fit for collecting data about user experience. In a think-aloud study, participants engage with prototypes and are expected to share their thoughts simultaneously as they explore these prototypes. When hearing users engage in think-aloud studies, they use their eyes and hands to engage with the interface, and 'think-aloud' in English. When deaf ASL-signers engage in the same task, they are using a language expressed and received via the eyes, body, face and hands, the same tools needed to engage with the interface. This required a shift in protocol to facilitate the deaf participants' ability to accomplish the required elements: to view the researchers signing to them in ASL, to express themselves in ASL, and to conduct hands-on activities while engaging with the interface. The ASL-signing team members guided the team in adjusting the methodology to align with the unique timing and visual nature of ASL.

Before starting the think-aloud study (which we translated in ASL as 'THINK-COMMENT' since the commentary in ASL is signed rather than spoken aloud), participants saw an introductory video describing the protocol in ASL. The instructions asked participants to view the user interface that was being studied, and as they progressed through, to share their comments, questions and thoughts in ASL. All participants were video-recorded. Since commenting in ASL concurrently while using hands and eyes to interact with an online resource is not possible, participants were asked to comment immediately upon viewing each screen and before beginning a task (e.g., to share initial impressions upon first viewing the UI design), in between actions, and after completing each task. To prepare participants before starting the study, researchers did a practice run with them, asking them to think-comment through an example activity, e.g. visualizing the windows in their home, then mentally describing and counting them. During the warm-up activity, we

were able to answer questions and provide feedback to ensure that the participant understood the expectations and process of the think-comment protocol, before moving to the study tasks. At that point, researchers began to collect data on participants' perceptions and thought processes while interacting with the prototype.

4.3.3 Remote Study Considerations. The qualitative studies (Studies 1 to 4) were conducted through different versions of Zoom over three years. Our team worked with multiple updates that changed the features, and often found that it was necessary to develop workarounds for various barriers and issues. For example, our researchers initally used the 'gallery view' mode while recording Zoom sessions. However, we found that Zoom's speaker mode highlighted only the speaking participants, and if that mode was not manually changed, the signer data was lost on the recordings. We lost one participant's data due to this issue in Study 2. To avoid data loss in subsequent studies, the researchers set up a second screen recording in addition to the Zoom recording to serve as backup if the Zoom recording did not save all the content signed in ASL. Another issue during Study 1 was that Zoom did not have a remote control feature allowing participants to interact with a prototype on a shared screen directly. Thus, our participants had to tell researchers where they wanted to click and the researcher clicked through the prototype for them. Updates to Zoom in subsequent studies allowed us to give participants remote control of shared screens so they could interact with prototypes directly.

Another key consideration was the layout and arrangement of the Zoom window. When discussing and referring to a layout in a visual language such as ASL, the arrangement of content needs to be considered to ensure that the researcher is pointing to the right place, and that we are correctly documenting what the particpant is pointing to. In the Zoom gallery view, older versions did not allow users to rearrange the tiles (Study 1), but newer versions did (Studies 2 to 4). This allowed the ASL-signing researchers' and participants' to better customize their viewing experiences, e.g. placing an ASL-signing researcher closer to a shared screen to more easily view both in proximal visual space.

Additionally, during Zoom screen sharing, participants had to shift their visual attention from viewing and controlling the prototype to the researcher's ASL instructions. In Zoom, as more people join and share their video, each video window is reduced in size proportionally, and ASL is very often much harder to comprehend when the video is small. To avoid reducing window sizes, only the ASL-signing researchers who were conducting the study and participants had their cameras on. Other researchers who were supporting or documenting the studies kept their cameras off.

In addition, when someone shares their screen on Zoom, participants' windows are automatically resized to be significantly smaller. In our protocol, we added a checkpoint to let the participant know they can resize their window as needed to more easily view the researcher and shared screen. Although this increased the participants' ability to effectively engage in the study, it also added variability in the size of the prototypes the participants viewed.

4.3.4 Eye Tracking Study Considerations. We conducted an eye-tracking study in person and identified adjustments needed to run an effective study.

Experiment Setup: Before the study was scheduled to take place, the team of researchers piloted the experiment with one Deaf participant to evaluate our design and revise as needed to optimize setup. Participants sat at a desk with a monitor and eye tracker placed in front of them. All ASL instructions were given before the study began. Through the pilot, we identified revisions that improved the succinctness and clarity of those instructions.

When conducting the study, a Deaf researcher reviewed the informed consent and other required forms with each participant upon arrival to the testing site. Two researchers then co-moderated the study, one hearing ASL-signer and one hearing non-signer. The co-moderators welcomed each participant, asked them to take a seat, then stood in front of them and behind the monitor participants were using during the study. The ASL-signing researcher interacted with the participant to explain the eye-tracker calibration process and the study protocol. They also informed participants that the device calibration might need to be reset more than once during the study. All instructions for each phase of the experiment were provided before the study began, so participants would not need to look away from the screen after starting the first task. The non-signing researcher ran the setup process, measuring the participant's distance from the eye tracker to ensure optimal data collection, and demonstrating the calibration software to participants.

Once the protocol was explained, only the ASL-signing researcher stood in front of the participant to allow communication and the moderator ran the calibration software to demonstrate it to the participant. During this demonstration, having the ASL-signing researcher in the sight line of the participant, but behind their screen and the eye-tracker enabled the participant to easily shift their gaze between the researcher and the screen while the calibration process was explained. Following the demonstration and instructions, both researchers moved completely out of sight line so the actual calibration could be done, and the study conducted without distractions that could cause participants to shift their eyes away from the computer, affecting the calibration, their performance, and the eye tracking study results.

Communication During the Experiment: If a non-signing researcher moderates a study, it is helpful to learn at least a few specific signs that might facilitate quick communication with the participants. The hearing non-signing researcher had learned basic ASL, and was therefore able to communicate directly with the deaf participants when re-calibration was needed. For example, during the re-calibration it was helpful that the hearing moderator knew the signs "again" and "sorry". The hearing researcher's ability to use basic ASL signs to welcome participants, provide simple instructions, and thank them after the study elicited positive responses, and appeared to make participants feel more comfortable during the study and appreciated for their contributions.

4.4 Qualitative Data Analysis with User Data in ASL

With each participant's consent, we recorded the interviews and think-aloud studies (Studies 1 to 4) conducted on Zoom. The team of researchers then worked to collectively analyze the data. This required making the ASL content accessible to the non-signing team members and developing processes to ensure that this was

done without losing or altering the original meaning of the data. In addition, we had to consider the appropriate way to store the video data we collected. These are described in more detail below.

4.4.1 Translating ASL Study Data into English. After the user study was conducted, we developed processes that ensured the original intent of each participant was preserved when interpreted and/or translated into English. Interviews and 'think-aloud' data were transcribed for non-signers on the team and translated quotes from these transcriptions were also used in written publications (e.g. journals or conference submissions). We hired highly skilled interpreters to provide voice-overs for the ASL recordings. The interpreters were prepped in advance with an overview of each study protocol, so they would be familiar what participants were being asked to respond or react to and have the context needed to interpret effectively. They were instructed to pay close attention to participants' responses to questions and designs, including affect and body language. The audio files were then transcribed using Otter.ai, an auto-transcription tool. Despite best efforts, these transcriptions were still not completely accurate. Therefore, a second round of review was conducted by the hearing native ASL signing researcher on our team to confirm accuracy and correct any errors, and to manually tag each comment with the correct speaker. Although auto-transcription tools are able to detect and correctly tag which hearing person is speaking, all audio in our transcripts came from the interpreter and the non-signing members of the team needed to know which ASL signer was commenting (i.e., researcher v. participant).The multi-step effort described above was laborious and time-consuming, but it had a significant positive impact on the reliability and accurate reporting of study findings.

4.4.2 Data Analysis Across Languages. In the data analysis phase, we reviewed the English transcripts, interpreter voice-over audio, and the ASL participant videos. We used Atlas.ti for qualitative analysis, which allows viewing the video and the transcript together, with synchronized scrolling. However, the transcripts Otter.ai generated had time stamps in a format that was not compatible with the Atlas.ti time format. To change this, we wrote a Python script that we used for all subsequent studies.

We conducted thematic analysis in Studies 1 to 4. During the first round of coding, the researchers familiarized themselves with the data and then conducted round 1 of coding individually. Subsequently, we met to finalize and agree on codes and themes. We iteratively discussed and revised our codes as a team. During the discussions, we often noticed a mismatch between the voice-over transcript codes and the video codes. Even after following the rigorous multi-step process for translating the ASL participant content into English, signing researchers noticed that important aspects of the affect data were missing. To avoid misinterpretation, the signing researchers directly coded the video rather than the voice-over transcript, while the non-signing hearing researchers coded the voice-over transcript. Thus, when working with voice-over transcripts, it is critical to consider how much of the affect is captured, understood, and interpreted accurately. Extra iterations of discussion should be added to the thematic analysis process to address any mismatch between the signed content and the voice-over transcripts.

4.4.3 Careful Data Storage. Because collecting data in ASL necessitates capturing participant faces, we take secure storage very seriously. We also have found that video files require considerably more storage space than text or recorded files, which is helpful to plan for in advance. We made sure that only the researchers who needed access to the data had access and that we had adequate storage space.

4.5 Writing and Sharing The Results With The Community

While writing up our results in HCI publications, we experienced challenges in the presentation format. Since publications are reviewed anonymously, screenshots of our system had to have blurred images of the signer's face, as it was often someone from the team. However, blurring the signer's face makes it hard to understand the signed language.

Signed language interviews also present a unique challenge in terms of anonymity of the participants since the signer's face is constantly visible. For instance, in traditional participant comments, quotations are based on the exact words they articulated. However, the quotations of signing participants are generally published in English, so they are taken from the interpretation of the message, rather than directly from their original comment in ASL. While it would be more authentic to directly quote a signer's comment, it is only currently possible to share a direct ASL quote from participants in video form, which would include their face and reveal their identity. Privacy considerations prevent researchers from using videos as a direct source for quotations. We typically included our participants' translated English quotes. However, the ASL versions, along with the English translations could have conveyed the sentiment better, which is currently not common. Further, if researchers did wish to share direct quotes from signing participants, informed consent forms would need to be revised to recognize and clearly state that anonymity is not possible in those cases.

In our research presentation videos, we include ASL along with English audio. This is a non-trivial task, requiring many days of effort, a high quality video production studio, and specialized expertise to translate, film, edit, and incorporate the ASL videos into our presentation slides to align both with the content and timing of the English audio, when the temporal needs of each language differ significantly. In addition, this was challenging to do within conference timelines which likely were not set with this effort in mind. We often felt that we could only include a quick highlight of our work since we were required to abide by the same presentation time limits conferences set for spoken-only presentations. We hope that our efforts have made our presentations and study results more equitably available to Deaf and ASL-signing viewers, particularly those who contrubuted to and participated in our research. However, we acknowledge that, despite our best efforts, it is still unlikely to be fully equal experience to that of hearing viewers.

5 Related Recommendations and Guidelines

Mack *et al.* [24] emphasize the importance of considering accessibility in all stages of the research process. They strongly recommend anticipating participant's needs. Specifically regarding the Deaf Community, they highlighted considering language, interpreters,

and considering the study setup space, (e.g. how the participant, interpreter, captioner, etc., are positioned in the space), and what this means in a virtual space when studies are conducted remotely. Kushalnagar and Vogler [20] offers guidelines for teleconferencing between Deaf and hearing users. Their recommendations for hearing and Deaf users meeting virtually include careful management of turn-taking, speaker identification, and chat box monitoring. Apart from this, researchers often report on accommodations made for other groups such as blind users [10], or older adults [1]. While related work has focused on asking for accommodations ahead of time, considering preferences and comfort, our reflections and recommendations are based on the lived experience of multiple studies. Our study practices also build on work from outside the HCI research community that has advocated for equitable access and inclusion of the Deaf Community in research practice [9, 11, 17, 19, 21, 28, 29].

6 Conclusion

Our goal is to share the lessons we learned while engaging in HCI user studies with deaf ASL-signers, and offer recommendations for future research in this area. When publishing studies involving and led by deaf ASL-signers, sharing specific details about study methodology, materials used, and techniques followed would enable the HCI research community to learn from the experiences of others. From there, as a community, we can evaluate and build on choices made, and begin developing guidelines for tools, materials and methods that align with the language and cultural norms of the Deaf Community. Conducting respectful and equitable research ensures that study results are valid. When such findings are then applied in the development of online tools, these tools ensure full inclusion and engagement of the users they are intended for. Well-aligned research tools and inclusive, respectful research practices can set the stage for increased equity with a broader group of study participants and researchers, including members of the diverse Deaf Community who are ASL-signers. Going beyond accommodations and accessibility, we hope these reflections and recommendations lead to a shift toward *ASL-centric HCI research methodologies* for working with the Deaf Community.

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References

[1] J. Arnott A. Dickinson and S. Prior. 2007. Methods for human computer interaction research with older people. *Behaviour & Information Technology* 26, 4 (2007), 343–352. https://doi.org/10.1080/01449290601176948 arXiv:https://doi.org/10.1080/01449290601176948

[2] Akhter Al Amin, Saad Hassan, Sooyeon Lee, and Matt Huenerfauth. 2023. Understanding How Deaf and Hard of Hearing Viewers Visually Explore Captioned Live TV News. In *Proceedings of the 20th International Web for All Conference*. 54–65.

[3] Larwan Berke, Christopher Caulfield, and Matt Huenerfauth. 2017. Deaf and Hard-of-Hearing Perspectives on Imperfect Automatic Speech Recognition for Captioning One-on-One Meetings. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility* (Baltimore, Maryland, USA) *(ASSETS '17)*. Association for Computing Machinery, New York, NY, USA, 155–164. https://doi.org/10.1145/3132525.3132541

[4] Rachel Boll, Shruti Mahajan, Tish Burke, Khulood Alkhudaidi, Brittany Henriques, Isabella Cordova, Zoey Walker, Erin Solovey, and Jeanne Reis. 2023. User Perceptions and Preferences for Online Surveys in American Sign Language: An Exploratory Study. In *The 25th International ACM SIGACCESS Conference on Computers and Accessibility* (New York, NY, USA) *(ASSETS '23)*. Association for Computing Machinery, New York, NY, USA. https://doi.org/10.1145/3597638.3608444

[5] Rachel Boll, Shruti Mahajan, Jeanne Reis, and Erin T. Solovey. 2020. Creating Questionnaires That Align with ASL Linguistic Principles and Cultural Practices within the Deaf Community. In *Proceedings of the 22nd International ACM SIGACCESS Conference on Computers and Accessibility* (Virtual Event, Greece) *(ASSETS '20)*. Association for Computing Machinery, New York, NY, USA, Article 61, 4 pages. https://doi.org/10.1145/3373625.3418071

[6] Danielle Bragg, Nicholas Huynh, and Richard E. Ladner. 2016. A Personalizable Mobile Sound Detector App Design for Deaf and Hard-of-Hearing Users. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility* (Reno, Nevada, USA) *(ASSETS '16)*. Association for Computing Machinery, New York, NY, USA, 3–13. https://doi.org/10.1145/2982142.2982171

[7] Danielle Bragg, Oscar Koller, Naomi Caselli, and William Thies. 2020. Exploring Collection of Sign Language Datasets: Privacy, Participation, and Model Performance. In *Proceedings of the 22nd International ACM SIGACCESS Conference on Computers and Accessibility* (Virtual Event, Greece) *(ASSETS '20)*. Association for Computing Machinery, New York, NY, USA, Article 33, 14 pages. https://doi.org/10.1145/3373625.3417024

[8] Janine Butler, Brian Trager, and Byron Behm. 2019. Exploration of Automatic Speech Recognition for Deaf and Hard of Hearing Students in Higher Education Classes. In *Proceedings of the 21st International ACM SIGACCESS Conference on Computers and Accessibility* (Pittsburgh, PA, USA) *(ASSETS '19)*. Association for Computing Machinery, New York, NY, USA, 32–42. https://doi.org/10.1145/3308561.3353772

[9] Stephanie W Cawthon and Carrie Lou Garberoglio. 2021. Evidence-based practices in deaf education: A call to center research and evaluation on the experiences of deaf people. *Review of Research in Education* 45, 1 (2021), 346–371.

[10] Maitraye Das, Darren Gergle, and Anne Marie Piper. 2019. "It Doesn't Win You Friends": Understanding Accessibility in Collaborative Writing for People with Vision Impairments. *Proc. ACM Hum.-Comput. Interact.* 3, CSCW, Article 191 (nov 2019), 26 pages. https://doi.org/10.1145/3359293

[11] Raychelle Harris, Heidi M Holmes, and Donna M Mertens. 2009. Research ethics in sign language communities. *Sign Language Studies* 9, 2 (2009), 104–131.

[12] Matt Huenerfauth, Elaine Gale, Brian Penly, Sree Pillutla, Mackenzie Willard, and Dhananjai Hariharan. 2017. Evaluation of Language Feedback Methods for Student Videos of American Sign Language. *ACM Trans. Access. Comput.* 10, 1, Article 2 (apr 2017), 30 pages. https://doi.org/10.1145/3046788

[13] Ryo Iijima, Akihisa Shitara, Sayan Sarcar, and Yoichi Ochiai. 2021. Word Cloud for Meeting: A Visualization System for DHH People in Online Meetings. In *Proceedings of the 23rd International ACM SIGACCESS Conference on Computers and Accessibility* (Virtual Event, USA) *(ASSETS '21)*. Association for Computing Machinery, New York, NY, USA, Article 99, 4 pages. https://doi.org/10.1145/3441852.3476547

[14] Hernisa Kacorri, Allen Harper, and Matt Huenerfauth. 2013. Comparing Native Signers' Perception of American Sign Language Animations and Videos via Eye Tracking. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility* (Bellevue, Washington) *(ASSETS '13)*. Association for Computing Machinery, New York, NY, USA, Article 9, 8 pages. https://doi.org/10.1145/2513383.2513441

[15] Sushant Kafle, Becca Dingman, and Matt Huenerfauth. 2021. Deaf and Hard-of-Hearing Users Evaluating Designs for Highlighting Key Words in Educational Lecture Videos. *ACM Trans. Access. Comput.* 14, 4, Article 20 (oct 2021), 24 pages. https://doi.org/10.1145/3470651

[16] Sushant Kafle, Peter Yeung, and Matt Huenerfauth. 2019. Evaluating the Benefit of Highlighting Key Words in Captions for People Who Are Deaf or Hard of Hearing. In *Proceedings of the 21st International ACM SIGACCESS Conference on Computers and Accessibility* (Pittsburgh, PA, USA) *(ASSETS '19)*. Association for Computing Machinery, New York, NY, USA, 43–55. https://doi.org/10.1145/3308561.3353781

[17] Sophie Kenway and Ruth Riley. 2022. An Integrative Review of User-Focused Methodologies with Deaf Participants to Inform a Culturally-Sensitive Research Checklist. *International Journal on Mental Health and Deafness* 5, 1 (2022).

[18] Michael Kipp, Quan Nguyen, Alexis Heloir, and Silke Matthes. 2011. Assessing the Deaf User Perspective on Sign Language Avatars. In *The Proceedings of the 13th International ACM SIGACCESS Conference on Computers and Accessibility* (Dundee, Scotland, UK) *(ASSETS '11)*. Association for Computing Machinery,

New York, NY, USA, 107–114. https://doi.org/10.1145/2049536.2049557

[19] Tomasz Krawczyk, Jan Piasecki, Mateusz Wasylewski, and Marcin Waligora. 2024. Ethics of research engagement with Deaf people. A qualitative evidence synthesis. *Journal of Deaf Studies and Deaf Education* (2024), enae024.

[20] Raja S. Kushalnagar and Christian Vogler. 2020. Teleconference Accessibility and Guidelines for Deaf and Hard of Hearing Users. In *Proceedings of the 22nd International ACM SIGACCESS Conference on Computers and Accessibility* (Virtual Event, Greece) *(ASSETS '20)*. Association for Computing Machinery, New York, NY, USA, Article 9, 6 pages. https://doi.org/10.1145/3373625.3417299

[21] Annelies Kusters, Maartje De Meulder, and Dai O'Brien. 2017. *Innovations in deaf studies: The role of deaf scholars.* Oxford University Press.

[22] Le Luo, Dongdong Weng, Guo Songrui, Jie Hao, and Ziqi Tu. 2022. Avatar Interpreter: Improving Classroom Experiences for Deaf and Hard-of-Hearing People Based on Augmented Reality. In *Extended Abstracts of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI EA '22)*. Association for Computing Machinery, New York, NY, USA, Article 318, 5 pages. https://doi.org/10.1145/3491101.3519799

[23] Kelly Mack, Emma McDonnell, Dhruv Jain, Lucy Lu Wang, Jon E. Froehlich, and Leah Findlater. 2021. What Do We Mean by "Accessibility Research"? A Literature Survey of Accessibility Papers in CHI and ASSETS from 1994 to 2019. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (Yokohama, Japan) *(CHI '21)*. Association for Computing Machinery, New York, NY, USA, Article 371, 18 pages. https://doi.org/10.1145/3411764.3445412

[24] Kelly Mack, Emma McDonnell, Venkatesh Potluri, Maggie Xu, Jailyn Zabala, Jeffrey Bigham, Jennifer Mankoff, and Cynthia Bennett. 2022. Anticipate and Adjust: Cultivating Access in Human-Centered Methods. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 603, 18 pages. https://doi.org/10.1145/3491102.3501882

[25] Shruti Mahajan, Khulood Alkhudaidi, Rachel Boll, Jeanne Reis, and Erin Solovey. 2022. Role of Technology in Increasing Representation of Deaf Individuals in Future STEM Workplaces. In *Proceedings of the 1st Annual Meeting of the Symposium on Human-Computer Interaction for Work* (Durham, NH, USA) *(CHIWORK '22)*. Association for Computing Machinery, New York, NY, USA, Article 16, 6 pages. https://doi.org/10.1145/3533406.3533421

[26] Shruti Mahajan, Zoey Walker, Rachel Boll, Michelle Santacreu, Ally Salvino, Michael Westfort, Jeanne Reis, and Erin Solovey. 2022. Towards Sign Language-Centric Design of ASL Survey Tools. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 538, 16 pages. https://doi.org/10.1145/3491102.3502047

[27] Kotaro Oomori, Akihisa Shitara, Tatsuya Minagawa, Sayan Sarcar, and Yoichi Ochiai. 2020. A Preliminary Study on Understanding Voice-Only Online Meetings Using Emoji-Based Captioning for Deaf or Hard of Hearing Users. In *Proceedings of the 22nd International ACM SIGACCESS Conference on Computers and Accessibility* (Virtual Event, Greece) *(ASSETS '20)*. Association for Computing Machinery, New York, NY, USA, Article 54, 4 pages. https://doi.org/10.1145/3373625.3418032

[28] Jenny L Singleton, Gabrielle Jones, and Shilpa Hanumantha. 2014. Toward ethical research practice with deaf participants. *Journal of Empirical Research on Human Research Ethics* 9, 3 (2014), 59–66.

[29] Jenny L Singleton, Amber J Martin, and Gary Morgan. 2015. Ethics, Deaf-Friendly Research, and Good Practice When Studying Sign Languages. *Research methods in sign language studies: A practical guide* (2015), 5–20.